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DECISION SUPPORT SYSTEM FOR DETERMINING QUALITY BANANA CHIPS USING THE WEIGHTED PRODUCT METHOD

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Abstract
Decision support system is part of computer-based information commonly used to support decision making in an organization or decision support system can be generated using several methods, one of which is the weighted product (WP) method. This method is chosen because of its completion method by using multiplication to associate attribute values, where the value must be raised first with the attribute weights in question. There are four types of banana samples that can be used for making banana chips, namely kepok banana, ambon banana, jackfruit banana, horn banana. Of four bananas are selected kepok banana and horns banana are good to be made with chips with an alternative value 0.270118051.

Keywords *: Decision Support System, Weighted Product, Banana*

1. INTRODUCTION

The business world and industry are currently increasing. Competition between industries to control the market is very large. This condition of course must be observed immediately in order to deal with the competition. The emergence of banana chips with various forms and quality as well as increasingly competitive price variations has resulted in an increase in people's purchasing power. The Constitution of the Republic of Indonesia No. 7 of 1996 concerning food is food as a basic human need which fulfillment is a human right of every Indonesian people must always be available at all times, safe, quality, nutritious, and varied at prices affordable to the people's purchasing power. To achieve all of that, a food system needs to be implemented that provides protection, both for those who produce and those who consume food, and do not conflict with public beliefs. [1]

However, choosing a good banana chips must be careful because in the making, sometimes there are criminals who mix oil with wax or plastic to make it more durable. Can cause side effects both other diseases and conditions and can affect health. Because the quality can affect the taste of the banana chips. Banana chips are generally thinly sliced and then fried using seasoned flour. Usually the taste is salty with a savory aroma of onions. For now, banana chips have both salty and sweet flavors.

The research conducted by Yosa'aro zail et al (2017) describes the Method Wighted Product can help in making decisions to determine the level of rambutan fruit according to predetermined criteria. [2] Research conducted by Septiyana Firdyana et al (2017) describes this decision support system made using a MySQL database. The results of this study are the application of the method *Weighted Product* to determine Raskin beneficiaries in Air Putih Village [3]. Method Using *Weighted* Product, method *Product Weighted* is more efficient because of the time required in a shorter calculation. This method was chosen because it can determine the weight value for each attribute, then proceed with a ranking process that will determine the quality of banana chips according to the criteria. With the ranking method, it is expected that the assessment will be more appropriate because it is based on the criteria and the weight that has been determined so that it will get more accurate results.

2. THEORY

2.1. Bananas

Banana is a type of tropical fruit that has a high enough potential to be managed. Bananas are rich in minerals such as potassium, magnesium, iron, phosphorus, and calcium. When compared with other types of plant foods, banana minerals, especially iron, are almost 100% absorbable by the body. Bananas also contain vitamin B, namely thiamine, riboflavin, niacin, and vitamin B6 (pyridoxine). Banana B6 contains 0.5 micrograms per 100 grams. [4]

2.2. Decision Support Systems

According to Kusrini, (2007; 15) Decision support systems are interactive information systems that provide information, modeling, and manipulation of data. This system is used to help decision making in semi-structured situations and unstructured situations, where no one knows for certain how decisions should be made (Alter, 2002). [5] The purpose of a decision support system, namely: (Turban, 2005): am semi-structured decision making or problems, provide support for the manager's benefit and not intended to change the manager's function. Increasing the effectiveness of decisions made by managers is more than improving efficiency and it allows decision makers to do computing quickly and at a low cost, Increased productivity, Quality support, Competitiveness , Overcomes cognitive limitations in processing and storage.

2.3. FMADM

In the Sutini and Muhamad Muslihudin Journal FMADM is a method used to find optimal alternatives from a number of alternatives with certain criteria. The essence of FMADM is to determine the weight values for each attribute, then proceed with a ranking process that will select the alternatives that have been given. Each approach has weaknesses and weaknesses. In the subjective approach the weight value is determined based on the subjectivity of the decision makers, so that several factors in the alternative ranking process can be determined freely. Whereas in the objective approach the weight value is calculated mathematically so that it ignores the subjectivity of the decision maker [5]. There are several methods that can be used to solve the FMADM problem. among others (Kusumadewi, 2006), Simple Additive Weighting Method (SAW), Weighted Product (WP), ELECTRE, Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) and Analytic Hierarchy Process (AHP) [6] [7]

2.4. Method Weight Product

Weighted Product (WP) is one method used to solve the Multi Attribute Decision Making (MADM) problem. Method Weighted Product (WP) uses multiplication to connect attribute values (criteria), where the value of each attribute (criterion) must be raised first with the weight of the attribute (criteria) in question. [8]

The preference for alternative Ai is given as follows:

$$S_i = \prod_{j=1}^{n} X_{ij}\ wj \qquad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

With i = 1, 2, ..., m and j = 1, 2, ... n.

Description:

Π =product

Si= score / value of each alternative

Xij = i alternative value to the jjattribute

wj= the weight of each attribute

Where $\sum w_j = 1$ is the rank

positive for the profit attribute and negative for the cost attribute. For *ranking*/finding the best alternative is done by the following formula:

$$v_i = \frac{\prod_{j=1}^{n} X_{ij}\ wj}{\prod_{j=1}^{n} (X_{ij}\cdot)wj} \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Description:

Vi = Alternative preference results to - i

Xij = Alternative rating per attribute
Wj = Weight attribute
i = Alternative
J = Attribute

3. RESEARCH METHODS

3.1 Data Collection

The method used in the process of collecting data is observation, literature study, and interview.

3.1.1 Observation Method Observation

Method is a data collection technique, where the researcher makes observations directly to the object of research to see closely the activities carried out (Ridwan 2004). Many things can be done by researchers, namely knowing the quality of banana chips by plunging directly into the production site from where we will know the manufacturing process. [9]

3.1.2 Interview

Is a technique of data collection conducted through face-to-face and question and answer directly between researchers to sources or data sources. Interview is divided into structured and unstructured interviews. Structured means that researchers have known exactly what information is extracted from a list of questions that have been systematically made. Unstructured means free interviews researchers do not use interview guidelines that contain questions that will be asked specifically and only make important points of the problem the respondents want to explore. Interview conducted by researchers with Mbah Puah is how to choose a good banana to make chips? That is the type of banana kepok that is old and the size of the banana is medium.

3.1.3 Literature review

Is a method that is done by searching for sources from books, theses and journals. [9]

3.2 Method Weighted Product

Weighted Product (WP) is wrong one method used to solve the Multi Attribute Decision Making (MADM) problem. Method Weighted Product (WP) uses multiplication to connect attribute values (criteria), where the value of each attribute (criterion) must be raised first with the weight of the attribute (criteria) concerned.

3.2.1 Criteria and Weight

In the process of the method, the *weighted product* criteria needed to be used as material for calculation in determining the best quality banana chips where the best and become the choice. The criteria in determining the best quality banana chips can be seen in table 1 below:

Table 1. Description of Criteria

Criteria	Description
C1	Taste
C2	Color
C3	Weight
C4	Texture
C5	Size

Next decision making gives preference weight for each criterion W (initial weight) can be seen in the following:

Table 2. Description of Weight

Criteria	Range of	Weight
C1	Very Good	4
C2	Good	3
C3	Less	2
C4	Bad	1

From each of these criteria we will determine the weights as follows:
Description: Bad = 1, Less = 2, Good = 3, Very Good = 4

1. Weighting *Fuzzy* To criteria taste

Table 3. Determining criteria

Range	Value *Fuzzy*	Weight
Asin	Very Good	4
Sweet	Good	3
Spicy	Less than	2

2. Weighting *Fuzzy* for Color

Table 4. Determining criteria Color

Range	value *Fuzzy*	Weight
Yellow	Very Good	4
Orange	Good	3
Brown	Bad	2

3. Weighting *Fuzzy* To Texture

Texture Table 5. Determining Criteria

Range	value *Fuzzy*	Weight
Crisp	Very Good	4
Hard	Less	2
Soft		1

4. Weighting *Fuzzy* To Size

Table 6. Define Criteria Size

Range	Value *Fuzzy*	Weight
Large	Very Good	4
Long	Good	3
Small	Less than	2

5. Weighting *Fuzzy* to Weight

Table 7. Design Criteria Weight

Range	Rated *Fuzzy*	Weight
Weight	Highly Good	4
Medium	Good	3
Lightweight	Less	2

6. Alternative Banana

Table 8. Advanced Alternative Banana

No	Alternative	Criteria			
		C1	C2	C3	C4
1	Banana	Sweet	Yellow	Long	Soft
2	Banana Banana Ambon	Yellow	Sweet	Soft	Long
3	Jackfruit Banana	Sweet	Soft	Yellow	Long
4	Banana Horn	Long	Yellow	Sweet	Soft

For the suitability rating of each alternative in each criterion, can be seen in table 9 below:

Table 9 Alternative Compatibility Rating for Each

No	Alternative	Criteria			
		C1	C2	C3	C4
1	Kepok Banana	3	4	3	1
2	Banana Ambon	4	3	1	3

3	Banana Jackfruit	3	1	4	3
4	Banana Horn	3	4	3	1

3.2.2 Alternatives tested

This study was used to determine the selection of bananas that are good for making into chips in accordance with the criteria that have been determined. Furthermore, it can be used and useful for all groups.

3.3 The Mindset

Framework in this study describes how to choose quality banana chips in Jatumulyo Village for snacks or snacks in the community.

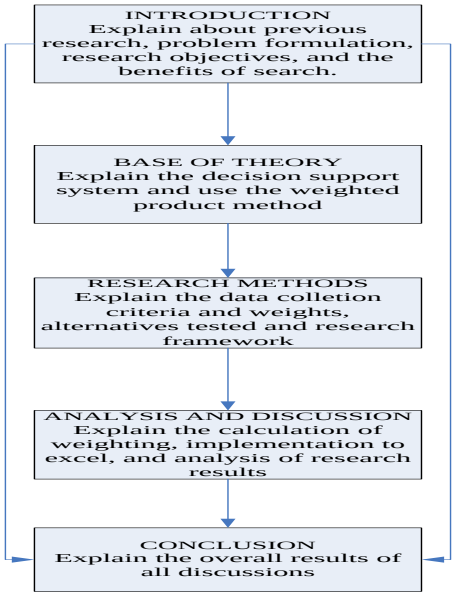

Image 1, Diagram Flowchart

4. ANALYSIS AND DISCUSSION

4.1 Calculation of weightings

The decision gives a weighting based on the level of interest of each of the required criteria as for the steps in the calculation method of *Weigthed Product* is as follows:

1. Determine the initial weight of each criteria

The initial weight of each the criteria are
W = (4,3,2,1).

2. Fix the weighted in a way

$$W_j = \frac{w}{\sum w} \dots\dots\dots (1)$$

so $$\sum wj = \sum wj = 1 \dots\dots\dots (2)$$

The way of settlement is as follows:

$$W_1 = \frac{4}{4+3+2+1} = \frac{4}{10} = 0{,}4$$
$$W_2 = \frac{3}{4+3+2+1} = \frac{3}{10} = 0{,}3$$
$$W_3 = \frac{2}{4+3+2+1} = \frac{2}{10} = 0{,}2$$

$$W_4 = \frac{1}{4+3+2+1} = \frac{1}{10} = 0{,}1$$

3. Calculate Vector S in the following way:

$$S_i = \prod_{j=1}^{n} X_{ij}\ wj \ldots\ldots\ldots\ldots (3)$$

Where w_j is the rank value positive for the profit attribute and negative value for the cost attribute. The way to solve it is as follows

S1 = $(3^{0,4})\ (4^{0,3})\ (3^{0,2})\ (1^{0,1})$
=2.930156051

S2 = $(4^{0,4})\ (3^{0,3})\ (1^{0,2})\ (3^{0,1})$
= 2.701920077

S3 = $(3^{0,4})\ (1^{0,3})\ (4^{0,2})\ (3^{0,1})$
= 2.2854547424

S4 = $(3^{0,4})\ (4^{0,3})\ (3^{0,2})\ (1^{0,1})$
= 2.9301560516

4. preferences will Deciding V_i to ranking:

$$v_i = \frac{\prod_{j=1}^{n} X_{ij}\ wj}{\prod_{j=1}^{n} (X_{ij}{}^{*})wj} \ldots\ldots\ldots\ldots..(4)$$

Where is the value V_i greatest is selected as for the alternative way to resolve as follows:

$$V1 = \frac{2.9301560516}{10.847686923} = 0,2701180512$$

$$V2 = \frac{2.701920077}{10.847686923} = 0,249077992$$

$$V3 = \frac{2.2854547424}{10.847686923} = 0,2106859055$$

$$V4 = \frac{2.9301560516}{10.847686923} = 0,2701180512$$

For more details on ranking process results can be seen in table 10 as follows:

Table 10. Ranking to Alternative

VJ	Alternative	Values	Ranking
V1	Kepok Banana	0.270118051	1
V2	Ambon Banana	0.249077992	2
V3	Jackfruit Banana	0.210685906	3
V4	Horn Banana	0.270118051	1

4.2 Analysis of Research Results

From the analysis of calculation of the method *Weighted Product* above, the highest ranking results obtained are the types of Kepok bananas which are good for banana chips with weight values = 0.270118051

5. CONCLUSION

5.1 Conclusion

The conclusions obtained by the author are as follows:

1. Method *Weighted Product* can assist in decision making for determine quality banana chips.
2. By using a Decision Support System the results obtained can be more efficient and in accordance with the criteria that have been determined.

5.2 Suggestion

This Decision Support System is far from perfect and there are still many shortcomings. Therefore, for a better decision support system, the suggestions for the next study are:

1. Decision Support System needs to be developed into a WEB-based SPK application so that people can get information about the quality advantages of banana chips and can access info from selection of quality banana chips directly through the media Internet.
2. In the future, this system is expected to be applied using other Decision Support System methods or comparing Methods *Weighted Product* with other Decision Support System methods such as Simple Additive Weighting (SAW), Topsis, Analytic Hyperarchy Process (AHP), or other SPK methods.

REFERENCES

[1] www.bphn.go.id/id/documents/96uu007

[2] E. B. Yosa'ara zail, Mesran, "Sistem Pendukung Keputusan Untuk Menentukan Buah Rambutan Dengan Kualitas Terbaik," vol. 1, no. 1, pp. 1–6, 2017.

[3] I. F. A. Septiyana Firdyana, Dedy Cahyadi, "PENERAPAN METODE WEIGHTED PRODUCT UNTUK MENENTUKAN PENERIMA BANTUAN BERAS MASYARAKAT MISKIN (RASKIN)," *Pros. Semin. Ilmu Komput. dan Teknol. Inf.*, vol. 2, no. 1, pp. 1–7, 2017.

[4] "NUSANTARANEWS.CO Diambil kembali dari https://www.nusantara.co/buah-pisang-kandungan-dan-manfaatnya. Diakses pada 7 Desember 2017.

[5] S. P. Tri Susilowati, Lampung, "Rancangan Sistem Pengambilan Keputusan Dalam Menentukan Pilihan Produk Laptop Menggunakan Metode Simple Additive Weighting (SAW)," *J. TAM (Technol. Accept. Model)*, vol. 5, pp. 1–5, 2015.

[6] M. A. Fadlun, K. Arivanty, and A. R. S, Henry Wibowo, "Sistem Pendukung Keputusan Untuk Menentukan Penerima Beasiswa Bank BRI Menggunakan FMADM (Studi Kasus: Mahasiswa Fakultas Teknologi Industri Universitas Islam Indonesia)," *Semin. Nas. Apl. Teknol. Inf.*, no. Snati, pp. 1–6, 2009.

[7] S. Muhamad Muslihudin, "Sistem Pendukung Keputusan Dalam Menentukan Kualitas Batu Bata Terbaik Di Wilayah Kabupaten Pringsewu Menggunakan Metode Simple Additive Weighting," *Proseding Senapati*, vol. 1, no. 1, pp. 1–5, 2016.

[8] I. S. Sianturi, "Sistem Pendukung Keputusan Untuk Menentukan Pemilihan Jurusan Siswa Dengan Menggunakan Metode Weighted Product (Studi Kasus: SMA Swasta HKBP DOLOKSANGGUL)," *Inf. dan Teknol. Ilm.*, vol. 1, no. 1, pp. 1–4, 2013.

[9] R. Wati and E. Mayasari, "Sistem Pendukung Keputusan Pemilihan Bibit Sapi Unggul Dengan Metode Simple Additive Weighting(Saw) Pada Peternakan Sapi Sriagung Padangratu Lampung Tengah," *J. TAM (Technol. Accept. Model)*, vol. 5, no. 2, pp. 1–7, 2015.